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Efficient and robust semi-supervised learning over a sparse-regularized graph

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AFFILIATIONS: State Key Lab of Intelligent Technology and Systems, Tsinghua National Lab for Information Science and Technology, Department of Computer Science and Technology, Center for Bio-Inspired Computing Research, Tsinghua University, Beijing, China; Department of Computer Science, Missouri University of Science and Technology, Rolla, United States

ABSTRACT: Graph-based Semi-Supervised Learning (GSSL) has limitations in widespread applicability due to its computationally prohibitive large-scale inference, sensitivity to data incompleteness, and incapability on handling time-evolving characteristics in an open set. To address these issues, we propose a novel GSSL based on a batch of informative beacons with sparsity appropriately harnessed, rather than constructing the pairwise affinity graph between the entire original samples. Specifically, (1) beacons are placed automatically by unifying the consistence of both data features and labels, which subsequently act as indicators during the inference; (2) leveraging the information carried by beacons, the sample labels are interpreted as the weighted combination of a subset of characteristics-specified beacons; (3) if unfamiliar samples are encountered in an open set, we seek to expand the beacon set incrementally and update their parameters by incorporating additional human interventions if necessary. Experimental results on real datasets validate that our algorithm is effective and efficient to implement scalable inference, robust to sample corruptions, and capable to boost the performance incrementally in an open set by updating the beacon-related parameters. © Springer International Publishing AG 2016.

AUTHOR KEYWORDS: Beacon; Online learning; Semi-supervised learning; Sparse representation

INDEX KEYWORDS: Computer vision; Graphic methods; Inference engines, Beacon; Evolving characteristic; Human intervention; Online learning; Original sample; Real data sets; Semi-supervised learning; Sparse representation, Supervised learning

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CORRESPONDENCE ADDRESS: Su, H.; State Key Lab of Intelligent Technology and Systems, Tsinghua National Lab for Information Science and Technology, Department of Computer Science and Technology, Center for Bio-Inspired Computing Research, Tsinghua UniversityChina; email: suhangss@tsinghua.edu.cn

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